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Spatial Knowledge in Business via Systemic Integration

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Abstract: A model to achieve technological development (DT) is proposed, in particular a satellite, with the following sub phases: 1. Analysis of international satellite system; 2. Analysis of the national satellite system; 3. Diagnose, using the SWOT (strengths, weaknesses, opportunities, threats); 4. Proposed solution; 5. Mission, vision, values and strategic objectives of the proposal; 6. Strategies using SWOT combinations: FO, FA, OD and AD; 7. Action plan; 8. Technological development. With analysis and diagnosis it was found that one of the great strengths in a country is the development of scientific research, in particular space, since the forties, but it is isolated, that is, not integrated in the productive industry and therefore state policy proposes establishing humanistic satellite companies to promote and preserve the ecology, self-financing, public, mixed, or private initiative, integrating scientific, basic and applied research, based on the goals, objectives and marketing strategies. Companies call for the design, construction and launch of satellites, thus providing efficient, fast, safe and cheap services to meet the demand of domestic and international users, as developed countries have done through their space agencies, in order to have DT in this area.

Key words: Satellite system · Telecommunications industry · Systemic approach

INTRODUCTION

When analyzing models of planning, [1-4] concluded that any model of this type can be designed into five phases: I. Analysis of information; II. Detection of the problem; III. Planning to solve problems and to project the organization; IV. Results; V. Evaluation. These phases can be divided into subphases which are a function of the importance that each author gives. In the proposed model, eight subphases are considered which are contained in the five phases shown in Table 1.

International Satellite System 1. Analysis: The Satellite Industry Association (SIA) released its 17th report on the performance of the sector in 2013. The study conducted by Tauri Group, says that the growth of the satellite industry increased slightly both in the US and worldwide with revenues of 195,300 million in 2013. The industry grew up by 3%, from US economic growth to 2.8% and the global average of 2.4%. The satellites provide 60% of revenue from the space industry, 320.000 billion and 4% percent of the revenues of the telecommunications industry that was five billion dollars. From approximately 1200 satellites currently operating today the SIA states that industry revenues have nearly tripled since 2004, with an annual growth of 11% on average. Satellite services have grown by 5%, generating 97,900 million [5].

Based on work done in [6-9] the success of international satellite technology development is mainly due to government intervention through space agencies such as the National and Space Administration (NASA) of the United States; the Russian Federal Space Agency (ROSCOSMOS); the China National Space Administration (CNA) and the European Space Agency (ESA). All emerging, developing space agencies are considered as a strategy of state policy in each country; strengthen basic and applied research generated in educational institutions and research centers, including the space and link and integrate the industrial sector of space. The bodies of national security, defense and marine, have their own development based on basic and applied scientific

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Table 1: Phases and sub phases for the satellite technology development.

Phases	Sub phases
I. Analysis of information	1.Analysis International satellite system
	2. Analysis of the national satellite system
Problem II. Detection	3. Diagnosis
III. Proposed solution	4. Proposed solution
IV. Planning	5. Mission, vision, values and strategic objectives of the proposal.
	6.Strategies, using SWOT combinations: OD and DA.
	7. Action Plan.
V. Evaluation Results	8. Technological development

The following describes each one of the eight sub phases:

research as any technological advantage is the main strategy of the armed forces. However, participating and collaborating with space agencies results in a greater impact on the DT. Space agencies in each country or European community, are closely related to each other and therefore participate in joint space projects.

Analysis of the National Satellite System: The mexican government regarded its Satellite System (SSM) as a strategic area to provide voice, data and video services to both national public and private institutions, which amended the Constitution of Mexico in Article 28 and began to communications services since 1985, with two satellites in orbits 113.5 and 116.8° W. Technology management (GT) of the mexican government was so efficient that by 1993 it had already obtained from the International Telecommunication Union (ITU), a new orbit, 109.2° W, with characteristics of continental coverage, where the Solidarity 1 was placed; in 1994 Solidaridad 2 was placed in the 113.5° W [10]. In 1995 the mexican government considered that the SSM was no longer a strategic, but priority area, so it changed again the Article 28, which allowed the emergence in 1997 of the private company known as Satélites Mexicanos (Satmex), with a share for the government of 20% of the shares without voting rights [10].

The Satmex 5, launched in 1998 in the orbit 116.8° W, four years behind schedule, also presented failures in 2010 and was replaced three years later in 2013 by the Satmex 8. The Solidarity 1 presented failures in 2000, so he pulled out of orbit and having no substitute satellite, ITU canceled orbit 109.2° W. However, this body accepted the request of Mexico and Canada to exchange 109.2° W by the 114.9° W to reduce interference problems. In this situation in 2006, six years later, the Satmex 6 was launched into orbit that had the Solidarity 2, with a slight modification instead of the 113.5° W was changed to 113° W and Solidarity 2 occupied the new orbit 114.9° W [11]. The Solidaridad 2 had to be relieved in 2008, which never happened, so it was placed in orbit inclined from that date to be out of orbit in 2013 leaving communications services to the Federal government for failure to inform Mexat. In August 2013, the French company Eutelsat bought Satmex for 831 million dollars. This company is the third largest in the world, handles around 31 satellites that provide services in Europe, Africa, Asia and from this acquisition will provide services to the American Continent [12].

To avoid the possible loss of satellite orbits Satmex had to replace its satellites in orbits allocated by the ITU and the need for national security and services for their sectors. The mexican government announced in 2010 the beginning the Mexsat system, Telecom Telegraph dependence Secretariat of Communications and Transportation (SCT) is the corresponding operator. In December 2012 the first of three satellites, called Bicentennial, in the same orbit as ranked Solidarity 2, four years behind schedule was released. Two satellites were scheduled for Mexsat, to be launched in 2013 and 2014 to date has not been made [13]. On December 17, 2010, the SCT signed with Boeing Satellite Systems International an agreement for the Mexsat system. The cost is about 16 billion pesos; for the construction 14 434 million of pesos, with 1 358 million relating to the launch, 235.2 million for insurance and 22 ground stations [13]. The ITU has a program assigning satellite orbits to countries that are part of this organization; Mexico was assigned four geostationary orbits (69.2, 127, 136, 78° 0) from 2005, which covers each of the national territory. Mexico got the ITU to assign a change from 77°O to 78°O as the first covers the region of the USA, the Caribbean, Central America and Mexico. Under these circumstances Quetzsat and US companies, SES Americom, kept the concession; satellites of the last company were placed in this orbit from 2005 until 2011, when the Quetzsat 1 satellite to be placed in that orbit was launched. The remaining three orbits are not being used [14].

Once Completed, the SSM Analysis Concluded That: Satellites used to cover the orbits assigned to Mexico, are designed, built and launched in other countries, implying that the cost thereof is very high; according to [15] the import of technology increases up to 40% of the actual value. This situation resulted in the cancellation of 109.2°O orbit as well as endangered the 114.9° and 116.8° W. In the end the government rescued the inefficient Satmex founding Mexsat. The mexican government in 12 years, bought 6 satellites; Satmex in 17 years bought 2. The import of satellite technology has involved the isolation of space research in Mexico. There are satellite orbits not being exploited and no technological development satellite

Diagnosis: To perform diagnostics, we apply the tool to determine the strengths, weaknesses, opportunities and threats (SWOT) for the SSM-

Strengths of the Mexican Satellite System: Domestic and international services are provided.

It has a regulatory communications system and in particular a satellite system that fits the strategies and technologies of the time.

It has human and technical resources with researchers in all areas of knowledge.

It has experience in designing and building rockets and satellites.

The Mexican Space Agency is a management agency for technology and space research.

Opportunities for the Mexican Satellite System: Participate in solving the problems of the satellite system, through the ITU and international satellite context.

The development sector (ITU-D) supports the development of telecommunications in the country mainly to fewer resources. Any country can apply for this support.

Mexico has been allocated seven geostationary satellite orbits by the ITU and has the opportunity to conserve and manage others.

Mexico can continue signing agreements with public and private institutions, as well as participating in meetings and forums.

Weaknesses of the Mexican Satellite System: Mexico has been allocated seven satellite orbits, which is only 2% compared with the US which has about 500.

There are no companies in Mexico for development, consulting, management, design, construction and launch of satellites.

Only with great effort can Mexico keep their geostationary satellite orbits.

There must be autonomous organizations such as the Federal Telecommunications Institute (IFT), which grants permissions assigned to users in the first instance benefiting the nation, rather than the interests of factual groups.

Professionals and researchers indirectly involved in satellite technology development human resources are generated.

There is no systemic integration of scientific research and development satellite development companies.

The satellites covering geostationary orbits have not been replaced in the time required.

Brain drain due to lack of opportunities for technological development.

Strength of economic and political groups working mainly for their own interests.

Disregard for basic and applied research.

Impairment of ecology and environment.

Threats to the Mexican Satellite System: Mexico could lose the orbits assigned ITU by not replacing the satellites in the required time and not using the three orbits, assigned since 2005.

Satellite garbage pollutes the space and Earth principally and endanger astronauts and satellites.

Proposal for Satellite Technology Development: The mexican State as regulator of the economy and driver of national policy, correlated with international, can set the policy of integrating scientific research in business and promote public and private investment to establish self-financing satellite companies that generate wealth, which can be public, mixed, or private initiative, which systemically integrate basic and applied scientific research to space technology development in order to provide an efficient, fast, safe and cheap service that meets the demand for domestic users and international.

Mission, Vision, Values and Strategic Objectives of the Proposal

Mission: Interface with the system of national and international communications to provide innovative national and international satellite services.

Foster the emergence satellite companies and integrate research, development and technology management in them, to create, transfer, disseminate and use satellite technology.

Strengthen, through SSM, national security, technological infrastructure for efficient communications coverage in all regions of the country, as well as educational, ecological, cultural and social programs.

Vision: Business. Generate profitable companies that provide individuals, professionals and researchers and graduates of educational infrastructure, from all areas of knowledge, the opportunity to participate in the technological development of SSM to reduce technological dependence and impact on the political, economic and social development of our country achieving results through rationalization of resources.

Values: Integrity. Act and communicate with responsibility, honesty and transparency within and outside companies.

Aspiration. Acting with passion and sense of urgency, impose challenges and achieve goals and objectives. Make decisions wisely, without fear of error or failure.

Human Resources. The reason for the organizations must be the welfare, nourishment within the company, human resources to work efficiently and effectively, considering the contributions of each member with a systemic approach for the common goal.

Natural Resources. No company is justified without caring and improving the ecology and environment.

Strategic Objectives

General Strategic Goal: Obtain technological development in the country.

Particular Strategic Objectives: Integrating research and technological development management in satellite companies.

Provide innovative, efficient, effective, quality and low-cost national and international public and private institutions as well as individual users.

Integrating people, professionals and researchers to satellite technology development.

Promote the development of ecology and environment.

Provide staff for the company, nourishment, training, welfare, cultural services and other benefits.

Strategies for the Development of the Mexican Satellite System: To raise the strategies we use the following combinations SWOT: FO, FA, OD, DA.

Strength Opportunities (FO): The SSM will continue to provide international services.

The mexican regulatory framework related to the international, will contribute to solve global problems and international satellite technology development.

Apply primarily to ITU-D, support to channel our resources to satellite technological development of our country.

The Mexican Space Agency is responsible for promoting the aerospace technological development in Mexico and represents the SCT internationally. If we have satellite technological development we will be in a position to disclose to the world our creation and use of technology.

Strength Threats (FA): Mexico actively participates in international organizations and for this reason should use ITU aid resources for satellite technology development, otherwise it has to depend on foreign technology and therefore is vulnerable to the risk that one or more satellite orbits will be canceled.

The development of SSM should take into account satellite ecology garbage and for that reason Mexico should make proposals to the ITU and other international bodies to assist with the concerned countries for the solution of these problems.

If human resources of the country are not channeled towards technological development of the country, they will seek opportunities in other countries and continue to have increasing problems in the political, economic and social fields.

Mexico has the resources to develop technologically and if not, will be subject to the interests of countries and transnational corporations, in addition to technology transfer costs about 40% more than its actual cost [15].

Weakness Opportunities (OD): Mexico can manage ITU support primarily the development sector (ITU-D) to promote entrepreneurship satellite development.

Mexico can participate in ITU forums as it is an active member of this organization.

Currently many efforts the geostationary satellite orbits are preserved, due in part to the import of technology that has a high cost. With technological development in the long term costs are lowered and less expensive and heavy satellites can be developed.

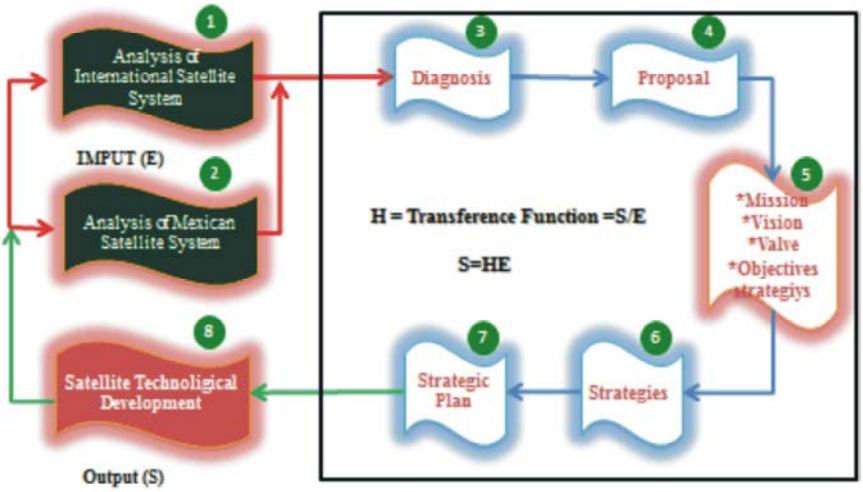

Fig. 1: Model for the satellite technology development in Mexico

Weaknesses Threats (DA): With satellite development the country will ensure its seven satellite geostationary orbits allocated by the ITU and be in a position to obtain others, otherwise they will be in danger and the social, political and economic problems we have now increased. In Fig. 4.1 the model for diagnosis and strategies for SSM is presented, using SWOT.

Strategic Plan for the Development of the Mexican Satellite System

International: Make international agreements with nations and various public and private institutions, primarily with space agencies to develop a system of interaction and cooperation, in order to establish mutual benefit generating scientific policies related to basic and applied research, creation, dissemination, transfer and use of technology in the area of communications, particularly in the satellite, enhancing innovation and ongoing review of the international regulatory framework that contributes to technological, political, economic, social and ecological development of our nations.

Participate in various forums, meetings and international working committees concerning space communication to actively participate in the development context of international satellite system and to address problems, among others, the hazards of the waste and Satellite ecological damage it causes. Mexico can rely on the development of telecommunications (ITU-D) sector. This sector was established to help spread equitable, sustainable and affordable access to telecommunications and, thus promoting greater economic and social development in nations and companies, especially the poorer countries [16]. Membership offers the opportunity to establish relationships with the best talent in the industry represented by more than 700 private sector entities, in addition to 194 governments that make up the UN and its regulators. Participation in the process of ITU standardization allows to directly influence the technological forces that decide the future of the industry of ICT [16].

National: Establish agreements with public and private institutions and governments of the States of the Republic to generate business for the creation, dissemination, transfer and use of technology in the area of satellite communications, in order to contribute to technological development, political, economic and social development of the country.

Legal Framework: Mexican Satellite System began to have a reference from the first wire telegraph system in 1951 to reform the LFT and TRF and TV in April 2011, the legal framework for telecommunications which is implicit has been reflecting changes in the mexican State: an interventionist state to a promoter and regulatory state. To foster technological development in communications the State should at least greatly reduce the powers of political and economic power groups working mainly for their own interests and to a lesser or greater extent some public officials have been involved. Throughout the history of communications the mexican government, with honorable exceptions, primarily benefited from those interests before those of the Nation [17].

Scientific Research: Space science research has led to the founding of agencies to coordinate, promote and support projects [18]. These agencies that the Federal government has generated are the National Commission of Outer Space (SENCO), the Mexican Institute of Communications (IMC) and the Mexican Space Agency (AEM). The first two were considered as failures [18]. In addition to these failures are abandoning the Satex project and the disappearance of the University Program for Space Research and Development (PUIDE) [19]. This is due to a lack of policy that systematically integrates scientific research in the productive sector.

Mexico has public and private institutions of higher education in basic scientific research which engineering, technology management, systems thinking, management, economics, design is generated and applied in all areas of knowledge, among others and development, etc. essential for technological development. Therefore, to make the connection of scientific research in satellite technology development it is necessary to do so through companies which must systematically integrate scientific research as did developed countries over 20 years ago [20].

Technological Development: With this step the cycle model for development in Mexico Satellite closes. Generally it is necessary to analyze each stage to make the necessary changes and constantly updating settings, because the system is constantly evolving. The space technology development is essential for everyday life as it has voice, data and video to at any point on Earth and it will result in economic and social political development of the country. The high costs for imported technology can be used to create long-term infrastructure with a decrease in costs and an increase in quality and thus enter a dynamic of constant innovation.

In Fig. 1 are the phases, see Table 1 and the subphases model for the satellite technology development.

CONCLUSIONS

State policy is to systematically integrate scientific research in companies based on their goals, objectives and marketing strategies in order to achieve technological development, to seek the welfare and preserve the ecology. This activity is now in progress. The SSM provides services to users for Mexico and the American continent, which generated revenues from 2005-2010 of about 5.25 billion dollars by year, so it is necessary to keep the satellite orbits, managing others, activate those unused and mainly generate technological development. The technological development of SSM is necessary because it allows the transmission and / or reception of data between satellites, these with earth stations, antennas installed in buildings, homes, space objects, etc. This communication between space and ground equipment is processed for voice, data and video and it generates new technological developments in all areas of knowledge, such as entertainment services, information, location of people and objects, internet, urban and rural telephone lines, television, distance education, among many others. For all this, satellite communications are essential for life and daily living, academic, labor organizations, industry, for the services of the mexican state and especially now, for national security.

Technological development is feasible based on the policies of the Mexico to establish bodies such as the SENCO, BMI and AEM that despite the success they have achieved in their functions and activities appear and disappear because they have failed the systematic integration research with the productive sector. In educational institutions and research centers it is exactly the same, with programs and projects such as PUIDE and SATEX emerging and disappearing because there has been no real need to solve specific problems in industry. Based on data, CIIYT occupied 16th place in 2011 if one looks at the 193 countries of the United Nations (UN) for the publication of research papers at international level. The problem is that investigations are concentrated on educational institutions and in the productive sector. Therefore it is concluded that if the industry is systematically integrated through a state policy it is feasible to transform the Mexican satellite system and the whole industry in general.

If we fail in technological development, most of the projects and research papers produced in our institutions, will only serve to swell the research statistics. The difficulties involved in combating the poverty that overwhelms us and other social conflicts will increase.

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